The Canadian Entomologist

LXVI ORILLIA, AUGUST, 1934 No. 8

ERIC HEARLE.

1893-1934.

It was indeed sad news which reached Ottawa on April 17, 1934, announcing the death earlier in the day of Eric Hearle, a most valuable officer of the Dominion Entomological Service. Mr. Hearle's health had been indifferent for some five years but he did not realize his condition until early January of 1933 when he attended meetings of dairymen and veterinarians at the coast and the effort in this regard affected his health to such an extent that on the advice of a Vancouver heart specialist he went to bed for several months, after which he was granted extended leave from continuous official duties. By midsummer his condition had improved to the extent of enabling him to conduct a certain amount of official work each day at his home, and there was promise of his living, with care, for many years.

With such improvement his confidence in his health returned, and by the spring of 1934 he was enthusiastically laying down extensive plans for the coming summer, in addition to carrying on taxonomic work. He thus overtaxed his strength and the end came suddenly, as he was reading the morning paper after an early breakfast.

Eric Hearle had a most interesting career. Born in India on July 21, 1893, he was in his forty-first year at the time of his death. His education was varied and extensive. He was privately tutored up to 1905 when he entered the Albert Villa preparatory school at Clifton, England, and in 1907, Bristol Grammar School. In 1911 he attended Bristol University until he came to Canada in 1912 and entered the Ontario Agricultural College at Guelph. When war broke out in 1914 he enlisted with the 4th Battalion at Hamilton, Ont., and went overseas with the First contingent. He endured much hardship and was severely wounded and his war experiences generally undermined his health. Returning to Canada in the autumn of 1916, he resumed his college course, graduating in 1917 with the degree of Bachelor of the Science of Agriculture. He then joined the college staff and during 1917 and 1918 was Resident Master and Lecturer in English Literature and Composition; in the former year he also assisted as Lecturer in Systematic and Economic Entomology and in Zoology. Summer periods during this time and in 1918 were spent in entomological research work on fruit farms under the Provincial Entomologist for Ontario. In May, 1925, he received the degree of Master of Science from the University of Alberta.

In 1919, Mr. Hearle was granted a studentship by the National Research Council of Canada to undertake an investigation of the mosquitoes of the Lower Fraser Valley of British Columbia, in co-operation with the Dominion Entomological Branch. In 1920, he was appointed Assistant Entomologist in the Federal service with headquarters at Mission, B.C., where laboratory facilities were provided to continue the mosquito investigations in 1920 and 1921. The results of

B & Z LIBRARY

these investigations constituted a valuable contribution to the knowledge of Canadian mosquitoes and were published in 1926 by the National Research Council as Report No. 17.

In 1921, Mr. Hearle made a brief survey of mosquito-infested areas in the Rocky Mountain National Park, adjacent to the town of Banff and the station of Lake Louise, Alberta. As a result of this preliminary survey, in the spring of 1922 he was assigned a detailed investigation of the problem and suitable headquarters for the work were provided by the Dominion Parks Branch of the Department of the Interior. This work was continued until 1925. Mr. Hearle built up a definite organization to put into effect full mosquito control operations for the district and undertook personal supervision of the control work from 1922 to 1924. The value of this work cannot be overestimated. It was commented upon most favorably by the Departments concerned and by the press of the surrounding district. The Parks branch, with the advice of the Entomological branch, has continued to put into effect each year since, the control program recommended by him.

While Mr. Hearle was stationed at Banff he made collections of bot flies and blood-sucking flies, especially blackflies and sand flies affecting, particularly, livestock.

In 1926, Mr. Hearle's headquarters were moved to Indian Head, Sask., to undertake livestock insect investigations. Surveys were made throughout sections of the Prairie Provinces and valuable contact established with cattlemen and others, as a result of which a great deal of information was accumulated regarding the major livestock pests.

In 1928, a special laboratory for live stock insect investigations was established at Kamloops, B.C., with Mr. Hearle in charge. Here, he found great happiness in the pursuit of his favorite studies. Having a genial and attractive personality he soon made friends with the various representatives of the live stock industry with whom he came into contact. During the period he was destined to remain in this work at Kamloops, he accumulated a vast amount of information regarding the various pests of cattle, sheep, etc. Recently he completed the manuscript for a large illustrated bulletin on live stock insects, the most important contribution of its kind ever made in Canada; it is hoped that means will be provided for its publication in the near future.

In the summers of 1931 and 1932, his expert advice was solicited by officials of the Canadian National Railway upon the blood-sucking flies of Jasper National Park. He spent some months of each year at Jasper and conducted as thorough a survey as he had done previously at Banff.

In addition to these major projects, Mr. Hearle instituted and later advised upon mosquito control projects in several towns and communities in the Dry Belt of British Columbia, whose local control boards have since closely followed his plans with complete success.

On account of his successful mosquito campaigns and knowledge of Canadian blackflies, Mr. Hearle was widely known among specialists in these families. His work on pests of cattle, especially warble flies, brought him into close association with farmers, both on the prairies and in British Columbia. More recently

he conducted important researches on ticks as vectors of disease. In 1930, he assisted in demonstrating the occurrence of the tick-borne disease known as tularaemia in wild rabbits in the North Thompson Valley. This is a plague-like disease of rodents, and is sometimes transmitted to man with fatal results. Extensive observations were made by him on tick paralysis, a condition affecting livestock and man and often proving fatal to cattle and sometimes to children. Mr. Hearle also lately published a paper having an important bearing on the first outbreak of relapsing fever in Canada which was recently recorded by two local doctors in the Kootenay district, B.C.: at the time of his death he was preparing to investigate the role of ticks in this connection.

As an officer of the Federal entomological service, Mr. Hearle served the department faithfully and zealously. He was a remarkably keen investigator, bringing to bear on his problems a noteworthy intelligence which enabled him to draw most of his researches to a successful issue. No one else in Canada had such a wide knowledge of the biology of western blood-sucking flies. All this knowledge he methodically and systematically recorded so that much of it has been published and certain taxonomic treatises upon which he was engaged just before his death will require but little expert revision before they too will be ready for publishing. Most of his contributions appeared in *The Canadian Entomologist* and *The Proceedings of the British Columbia Entomological Society*. His branch publications are the following:

Circular No. 62—"Mosquito Control in Canada" (jointly with C. R. Twinn).
Pamphlet No. 147—New Series, "Warble Flies and Their Control in Canada."

In the death of Eric Hearle, the Entomological Branch has lost an exceedingly valuable officer, the science of entomology a devoted student, those who knew him a staunch and much loved friend, and the public at large a worker who contributed so materially to the health of man and animals in the communities in which he laboured.

He leaves behind his wife, who aided him in no small measure in all his labours, especially in recent years, and three children. ARTHUR GIBSON.

NOTES AND NEW SPECIES OF MICROLEPIDOPTERA FROM WASHINGTON STATE.

BY J. F. G. CLARKE,
Department of Zoology, State College of Washington.

PTEROPHORIDAE.

Pterophorus delawaricus Zeller.

In the latter part of May, 1933, larvae of this species were found feeding in the leaves of *Hieracium scouleri* Hook. Their presence was easily detected by the great distortion caused to the leaves, which were webbed together, particularly at the terminal ends, thus arresting normal development. All were collected at Pullman, Washington, by the writer.

The larvae feed inside this very badly distorted mass and pupate in the leaves. The moths emerged from June 9 to June 12, 1933.

Platyptilia punctidactyla Haworth.

During the summers of 1932 and 1933 a fairly large series of this species was reared. A series of six specimens was reared from larvae collected at Pull-

man, Washington. The larvae were feeding on *Castilleja lutescens* (Greenman) Piper and *C. angustifolia* (Nutt.) G. Don. The work of the larvae of this species may be easily confused with that of the larvae of *Gnorimoschema lutescella* (herein described), the two being found commonly together.

In August, 1933, the writer spent several days on Skyline Ridge, Mt. Baker District, Washington. Among the larvae collected were several from which a series of five specimens of *punctidactyla* was reared. These latter larvae were found feeding on *Pedicularis bracteosa* Benth. and on *Castilleja* sp. The larvae were collected on August 17, 1933, and the moths emerged from August 28 to September 1, 1933.

Oidaematophorus occidentalis Walsingham.

Three specimens of this species were reared from *Wyethia amplexicaulis* Nutt. and *Balsamorrhiza sagittata* (Pursh) Nutt. The larvae are external feeders on the leaves.

All of the larvae were collected at Pullman, Washington. The moths emerged from June 13 to June 29, 1933.

GELECHIIDAE.

Telphusa sedulitella Busck.

Telphusa agrifolia Braun, Ent. News, 32: 9, 1921.

My thanks are due Mr. S. E. Crumb of Puyallup for this record.

A few larvae and pupae of this species were sent to me in June, from which a series of five specimens was obtained. The moths emerged from July 2 to July 7, 1933. The recorded food plant of this species is *Quercus*. The specimens from Puyallup were bred from *Corylus* (*californica?* (A.D.C.) Rose).

Gnorimoschema lutescella sp. nov.

Figs. 1, 1a, 2.

Antennae jet black, faintly annulated with white. Labial palpi white, heavily irrorated with blackish-fuscous beneath and externally. Tip of terminal joint frequently black. Head white, with a scattering of fuscous or black scales. In front of eyes a rather heavily black scaled area. The white of the head sometimes shows a faint but distinct pinkish cast. Thorax, patagia, and dorsal third of forewing dull ochraceous-tawny. Base of patagia blackish-fuscous, finely irrorated with white. Dorsal third of fore wing streaked with white. Costal two-thirds of fore wing black to fuscous irrorated with white; extreme edge of costa and apical third of fore wing heavily irrorated with white. There is a narrow, somewhat broken ochraceous-tawny longitudinal line in costal third; also a dusting of ochraceous-tawny scales throughout the dark portions of the wing. Hind wing grayish-fuscous. Cilia of fore and hind wing brownish-fuscous. Abdomen dark fuscous above, with basal joints velvety ochraceous; underside creamy white with two rather ill-defined longitudinal, lateral, fuscous lines. Legs white inwardly with or without a pinkish cast; outwardly fuscous, irrorated with white. Tarsi fuscous, white annulated.

Male genitalia with the uncus broad, spoon-shaped, indented on terminal edge; gnathos fused into an anchor-like process, with the lateral "hooks" fimbriated. Harpes with one long slender branch having a wing-like ventral process; a small, rather stout, heavily chitinized arm, blunt pointed and haired distally and having a stout, short, finger-like basal projection. Vinculum short, evenly

rounded. Aedoeagus long, slender, with a saw-toothed lateral distal edge having 11 (specimen No. 3145) to 15 (specimen No. 4476) teeth.

Mr. Busck has written me that the gnathos of this species is not characteristic of this genus.

Female genitalia, the signum a strongly chitinized hook.

Alar expanse: 9-12 mm.

Type: U.S.N.M. No. 50177.

Type locality: Pullman, Washington.

Food plant: *Castilleja lutescens* (Greenman) Piper.

Described from the type male, seven ♂ ♂ and four ♀ ♀ paratypes, all from the type locality. Paratypes in U. S. National, Canadian National, H. H. Keifer (Sacramento, California) and author's collections.

The larva is as follows: Length 7-8 mm. Head light brown. Thoracic shield light brown with a fine light green transverse band anteriorly and a dark brown band posteriorly, both bisected medianly by the light brown ground colour. Thoracic and abdominal segments very pale green with a broken, dull red, dorsal line and two very much broken, irregular dull red lateral stripes; ventrally the segments are faintly suffused with dull red. Suranal plate brownish-black, thoracic legs light green.

The work of this species is difficult to distinguish from that of the young larvae of *Platyptilia punctidactyla* Haworth. The larvae of both species attack the flowers of the food plant, feeding inside the tube-like corollas and finally in the immature ovaries.

The larvae are found in May and early June. The bulk of the type series was obtained from larvae collected May 22, 1933. Seven larvae entered the soil in the breeding chamber on May 28, 1933, and were followed by others a few days later. The first moth emerged on August 8 and the last on September 2, 1933. Two specimens were reared in 1932. One entered the soil June 11 and emerged August 6, the other burrowed into the soil June 10 and emerged August 18, 1932.

Gnorimoschema octomaculella Chambers.

The work of this species is very noticeable during the early part of May at the Snake River, Whitman County, opposite Clarkston, Washington. The larvae feed on *Chrysothamnus nauseosus* (Pall.) Britt. and another allied species.

The larva is as follows: Length from 8 to 9 mm. Body cylindrical, tapering rather abruptly at the head and gradually posteriorly, thoracic segments thickest. Head pointed anteriorly; light yellowish-brown; epicranial sutures and mouth parts dark brown; ocelloid area black. Thoracic and abdominal segments varying from dirty yellowish-brown to wood brown. Thoracic shield and suranal plate concolorous. Thoracic legs yellowish.

On May 5, 1933, a large number of larvae were collected from which a series of 23 specimens was reared. Three others were reared in 1932.

The activity of the larva causes the formation of a beak-like gall on the *Chrysothamnus* sp. (This having very narrow leaves). The formation of this is brought about by the modification of the leaves, which become flattened and thin and grow together at their edges. This forms a hollow, thin-walled retreat in which the larva remains until mature. The gall is thickest at the proximal

end and tapers either gradually or abruptly toward the distal end.

On *C. nauseosus* the tendency to gall formation manifests itself in a somewhat different manner. The leaves of this plant are flat and are joined together in much the same manner as the leaves of the foregoing plant, but instead of a beak-like structure being produced there is a spherical, gall-like retreat constructed with the tips of the leaves protruding from the distal end.

When the larva is mature it descends to the ground where pupation occurs.

The larvae collected on May 5 began pupating very shortly after having been brought into the laboratory, and emergence of the moths took place from June 12 to June 22, 1933.

Aproaerema nigrella Chambers.

Mr. Busck has written me that he has identified this species from Wyoming where it is economically injurious to Lupine.

I have found this species at Pullman, Washington, abundant on *Lupinus ornatus* Dougl., mining the leaves of the food plant. However, its activities are seemingly confined to the indigenous food plant so that it is not of economic importance here.

There are three specimens before me which emerged in the laboratory on February 22, March 20, and May 6, 1933. The larvae for these were collected in August, 1932. There is a considerable number of pupae on hand at the present time, the winter normally being spent in this stage.

Gelechia braunella Keifer.

Mr. Keifer described this species and the race *arborei* (Pan. Pac. Ent. 8: 67-70, 1931) from larvae collected on Lupine in the interior and on the coast of California respectively. He has given the racial name *arborei* to the coastal variety, which is lighter than the species.

During the summers of 1932 and 1933, 25 specimens of this species were reared from *Lupinus ornatus* Dougl. All of the larvae were collected at Pullman, Washington, during May and June. The moths emerged from June 8 to July 13.

The larvae were identical with those described by Keifer, but the moths show great variation, from the very light *arborei* to a variety darker than two paratypes of *braunella* which I have before me. The alar expanse varies from 13 to 20 mm. which goes below the specifications given by Keifer for the smaller specimens but which comes well within the size given for the larger individuals. The genitalia show no differences. The variations in color are not confined to either sex.

In view of the data recorded here, I believe that Keifer's *arborei* should be considered as identical with his *braunella*.

In a letter from Mr. Keifer dated December 20, 1933, he states that in the San Francisco Bay region several Micros show a decided preference for the exposed slopes (ocean side) or the inland ridges. All of the Pullman specimens were collected on open grassy slopes. Mr. Keifer further states that in the bay region the races are apparently distinct.

Gelechia caudatae sp. nov.

Figs. 3, 4.

Antennae blackish-fuscous, irrorated with creamy white scales, especially toward the base. Labial palpi black; distal half of tuft, inside of second joint, and terminal joint creamy white. Face creamy white edged with black laterally. Head, patagia, thorax and ground color of fore wings creamy white to grayish, the scales fuscous tipped. Extreme base of costa jet black; subcosta markedly creamy white on basal two-fifths, with a suffusion of grayish in some specimens. There is a prominent black, longitudinal discal dash preceded and followed by small creamy white spots. In one or two specimens these latter spots are obscured. Cilia light fuscous with a lavender cast and tipped with creamy white. Hind wings grayish-fuscous, darker toward apex; cilia light fuscous, tipped with creamy white. Abdomen grayish above, shining white beneath with a black lateral stripe. Legs with femora white; tibia and tarsi creamy white heavily overlaid with fuscous.

The males of this species show a considerable suffusion of gray and are not so clearly marked as the females. The lavender suffusion of the cilia of the fore wings is much more pronounced in the females.

Male genitalia with the uncus broad, rather heavily chitinized; posterior edge toothed, each tooth bearing a long hair. Gnathos consisting of two finger-like projections. Harpes bilobed, the lobes closely parallel. Vinculum with a long narrow anterior projection. Aedoeagus pointed, with a lateral hook-like projection and toothed basally.

Female genitalia; bursa without signum; ductus with a chitinous band near posterior end.

Alar expanse: 13-15 mm.

Type: U.S.N.M. No. 50178.

Type locality: Pullman, Washington.

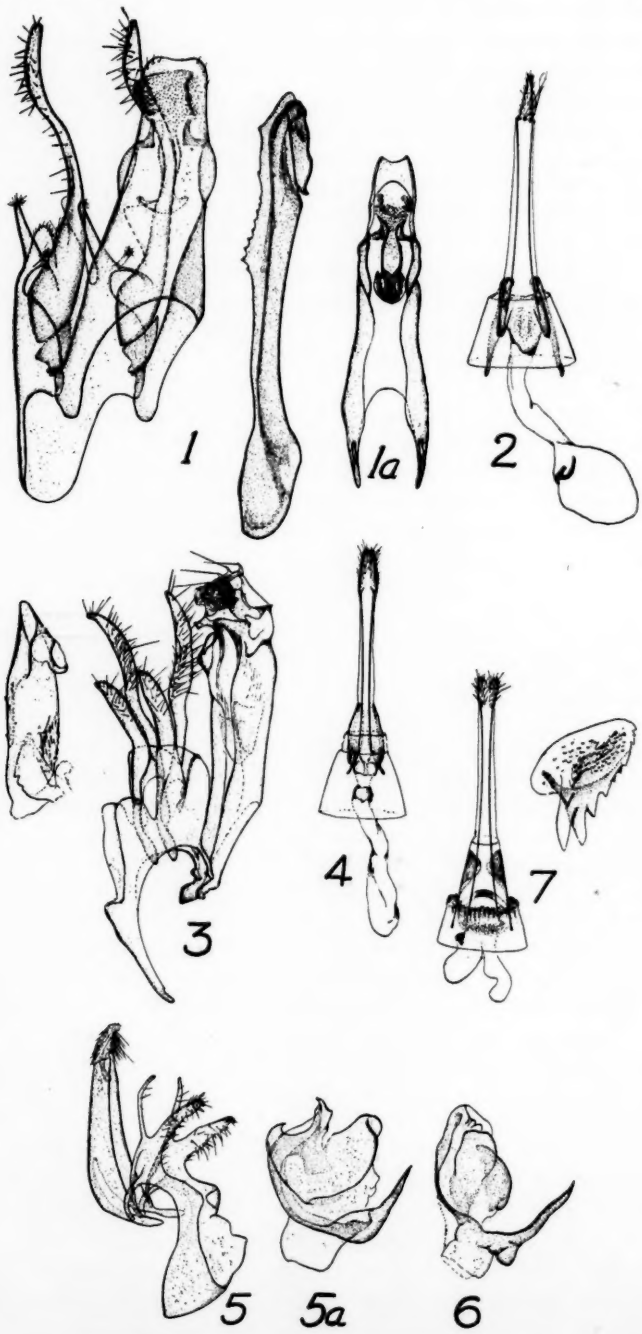
Food plant: *Salix caudata* (Nutt) Heller. Described from the male type, three ♂ ♂ and three ♀ ♀ paratypes, all from Pullman, Washington. Paratypes are distributed in the U. S. National Museum, Canadian National Collection, H. H. Keifer and author's collections.

The larvae from which the type series was reared were collected by Mrs. J. F. G. Clarke. A description of the larva is as follows: Length 9-10 mm. Entire larva pale whitish-green. Head with two grayish spots on the posterior lateral margins; mouth parts brown; ocelli black. Thoracic shield dorso-laterally spotted with gray to brown. There are two narrow whitish dorsal stripes. Abdominal and thoracic segments dorsally suffused with pink. The pink suffusion is more pronounced toward maturation of the larva. Thoracic legs light green. Tubercles and spiracles concolorous with segments. Setae light brown.

The larvae of this species are leaf-tiers, working mainly in the terminal leaves. All larvae were collected June 19, 1933. Pupation took place from July 1 to July 6 and emergence of the adults from July 21 to July 25, 1933.

Gelechia ornatifimbriella Clemens.

A series of 22 specimens was reared from *Lupinus ornatus* Dougl. All of the larvae were collected at Pullman, Washington, by the writer. The work



MICROLEPIDOPTERA FROM WASHINGTON STATE.

of these larvae is indistinguishable from that done by the larvae of *Gelechia braunella* Keifer, and the larvae of both species are found together on the same plants.

The moths emerged from July 12 to August 1, 1933.

Gelechia lepidotae sp. nov.

Figs. 5, 5a, 7.

Antennae, palpi, head, thorax, and ground colour of fore wings grayish-olive. All scales tipped with fuscous. Antennae heavily overlaid with fuscous. Second joint of palpi light grayish-olive inwardly; tuft fuscous. Discal spots fuscous or black, sometimes indistinct; one small, followed by a larger one. Fore wings variously streaked by ochraceous-tawny scales with a concentration of them in the apical third; cilia grayish, tips whitish. Hind wing grayish-fuscous. cilia brown in basal half; outer half indistinctly banded with three gray and two brown narrow bands. Abdomen gray above, white beneath with a fuscous lateral stripe. Legs creamy white; tibia and tarsi heavily overlaid with fuscous. Underside of hind wing of male with curtain-like fringe from costa.

Male genitalia with uncus narrow, hood-shaped; gnathos weak, hook-shaped. Harpes bilobed; one slender and one broad lobe, asymmetrical. Vinculum broad, very asymmetrical, weak on the left side. Aedoeagus broad with a straight, strongly chitinized anterior-ventral pointed projection. Eighth abdominal segment modified to form cover for genitalia when at rest.

Female genitalia with large bursa and very prominent signum, the latter with four large teeth and several lesser ones from the anterior surface. Ostium with a narrow dorsal band and small lateral spined plates. Ventrally heavily haired and folded.

This species is very close to *G. ornatifimbriella* Clemens (Fig. 6), from which it may be distinguished by the following: In *lepidotae* the vinculum is very asymmetrical and the aedoeagus very broad and armed with a stout straight projection. The vinculum of *ornatifimbriella* is not noticeably asymmetrical, the aedoeagus is much more slender than that of *lepidotae*, and the anterior-ventral projection is more slender and wavy. The bursa of the female of *lepidotae* is equipped with a very prominent signum; the bursa of *ornatifimbriella* lacks a signum. The secondary sexual scaling from the costa on the underside of the hind wings is the same in both species.

Alar expanse: 14-18 mm.

Type: U.S.N.M. No. 50179.

Type locality: Snake River, Whitman County, Washington, opposite Clarkston.

Food plant: *Glycyrrhiza lepidota* Nutt.

Described from the male type, one ♂ and five ♀ ♀ paratypes. Paratypes in U. S. National Museum, Canadian National Collection, H. H. Keifer and author's collections.

The larvae were collected July 28, 1933, and the adults emerged from August 28 to September 7, 1933.

When the writer collected the larvae of the type series he mistook them for the larvae of *ornatifimbriella*, which they closely resemble. The work of the two is almost identical, and the difference in the food plants was not con-

sidered significant. Hence no detailed description of the larva of *lepidotae* was made, but next season should bring forth the desired information.

The species is quite common, at least in the Snake River Valley, as evidenced by the fact that many examples of the work of this species were found at numerous places along the river during September.

Trichotaphe setosella Clemens.

Although only six specimens of this striking species were reared, the larvae were found to be very numerous on *Aster Etoni* (Gray) Howell. The leaves of the food plant are rolled or tied together to form close fitting tubes, in which the larvae remain when not feeding.

The larva is as follows: Length 13-15 mm. Head round, black, slightly dorso-ventrally compressed. Prothoracic shield shining black; the rest of the prothorax and the mesothorax purplish-black. There are four pure white dots dorsally on the posterior part of the mesothorax. The purplish-black of the prothorax and mesothorax is continued to the middle of the metathorax in two dorso-lateral points. The remainder of the metathorax and the abdominal segments are grayish-olive, lighter beneath and marked in the dorsal half by four longitudinal whitish stripes. The first and second pairs of thoracic legs are almost black. The third pair is yellowish with the terminal joint brown. Suranal plate yellowish, marked with a few grayish to black spots. The plate is produced caudally to a short, blunt but distinct point. Tubercles black, edged with white. Setae black.

The larvae were collected at Pullman, Washington, on June 17, 1933. Pupation took place from June 18 to June 22, and the moths emerged from July 2 to July 8, 1933. Another larva was collected June 30, 1933. Pupation took place within the leaf roll July 3, and the moth emerged July 14, 1933.

Many larvae pupated but failed to reach maturity. There is one collected specimen before me from Pullman, taken on August 7, 1933.

OECOPHORIDAE

Depressaria juliella Busck.

The larva of this species is as follows: Length 17 to 19 mm. Cylindrical, thickest near the middle and gently tapering toward each end. Head black. Thoracic shield light golden brown, edged laterally with a broad black band; dorsally bisected with a narrow whitish to yellow line and marked with a few small scattered brown to black spots. Thoracic and abdominal segments bright yellow to light yellowish-green, somewhat lighter ventrally; dorsal third gray. In some specimens this dorsal gray colour is divided into three irregular longitudinal stripes due to the attenuation of the gray with the yellow colour of the segments replacing it. On the thoracic and first abdominal segments there is a suffusion of gray ventro-laterally. The tubercles are black with a broad white ring on the outside. Setae and spiracles black. Suranal plate yellow to golden brown with a few scattered black or brown spots. Thoracic legs yellowish-brown.

A series of 53 specimens of this species was reared from larvae collected on June 30 and July 2, 1933.

One or more larvae feed in an umbel of the food plant, *Cicuta occidentalis* Greene. The rays of the umbel are tied together to form an erect compact

mass. The feeding seems to be confined to the inflorescence. When the feeding has been completed, the larva descends the plant, bores a hole in the stalk, and pupates within. The hole is left open, but a thin membrane is constructed across the hollow portion of the stalk between the hole and the larva. As many as six pupae have been found in one stalk. The habit of entering the stalk for pupation is like that of *D. heracliana* De Geer, *D. multifidae* Clarke, and others of this genus.[1] On July 2, 1933, 20 pupae were collected, but only one imago was obtained from them. I cannot account for the great mortality of these pupae, since these and the pupae from collected larvae were kept under identical conditions.

The pupation period for the 53 specimens bred ranged from nine to 14 days with an average of 11.05 days for the group. Pupation began on July 7 and continued to July 17. Emergence of the imagos lasted from July 18 to July 26, 1933.

All of the larvae and pupae were collected at Pullman Washington, by the writer.

Depressaria multifidae Clarke.

In my paper (Can. Ent. LXV: 87, 1933), I stated that the larva of this species feeds first in the sheaths and then in the flower stalk, where pupation takes place. This is quite the case, but additional rearings during the summer of 1933 have revealed the fact that the larva of this species feeds in the leaves after leaving the leaf sheaths and then when near maturity enters the flower stalk as do the larvae of *D. heracliana, D. juliella,* and others of the genus, and then pupates after additional feeding within the stalk.

Thinking this habit to be true for *leptotaeniae* also, a search of the stalks was made but failed to reveal any larvae or pupae within them.

OLETHREUTIDAE.

Suleima baracana Kearfott

A series of five specimens was reared from larvae collected on *Helianthella douglasii* T. and G. All larvae were collected at Pullman, Washington, by the writer.

The larva is as follows: Length 14-17 mm., cylindrical, thickest about middle, gradually tapering toward each end. Head round, small, reddish-brown. Mouth parts, ocellar area, and a small spot on posterior lateral margin dark brown.

Thoracic shield golden brown with a suffusion of dark brown on the posterior margins. Thoracic and abdominal segments bright orange-yellow. Suranal plate light brown. Thoracic legs light brown, the color somewhat darker distally.

The larva of *baracana* commences feeding in the immature seed heads of the food plant. After feeding there for a short time it begins to mine down the flower stalk. As the feeding progresses the entire stalk is hollowed out, the frass being pushed up to the upper part of the stalk. Feeding continues till fall, when the larva may be found in the crown of the plant. Feeding is completed; the larva becomes mature and prepares a covered exist hole about four to six inches above the crown. The larva then constructs a rather weak pupal

[1]Busck, A., Proc. U.S.N.M. 24: 734, 1902.

cell of silk an inch or more below the exit hole and remains in this during the winter as a larva. Pupation takes place in the spring (normally), and the moths emerge in May.

This is a very common species in this vicinity during May. The moths of the reared series, however, emerged during October (three), November (one), and December (one), 1933. There is no doubt that these winter records resulted from the larvae having been kept indoors, but on the other hand one larva pupated in August and the moth died in its attempt to emerge in early September. Numerous stalks of the food plant were observed in September about seven miles west of Pullman, and each stalk showing infestation had an open exit hole about five or six inches above the ground, indicating that the moth or a parasite had emerged. Nevertheless, the writer has never seen the moth on the wing in the fall but, as stated above, has found it to be common in May.

Thiodia amphorana Walsingham.

A series of six specimens was reared in 1932, and 11 more specimens were reared this season (1933) from *Grindelia* (*hendersoni?* Greene). All of the larvae from which these series were reared were collected at Bellingham, Washington, in August of each year.

The larva is as follows: 10-12 mm. Cylindrical, robust, sordid whitish. Head yellowish-brown, variously mottled with dark reddish-brown. Ocellar area and mouth parts dark brown. Thoracic shield light yellow-brown variously spotted with small reddish-brown spots. There is a semi-circle of these small spots just inside the posterior margins on each side of the shield. Spiracles narrowly edged with reddish-brown. Setae brown. Thoracic legs and suranal plate concolorous with segments.

Both the larval and the pupal stages are spent in the seed head of the host. Entrance is gained through the underside of the flower, and the larva then feeds around the periphery of the seed head and lines its tunnel as it goes. Frass is ejected through the entrance hole. The pupal cell is constructed in the seed head, and the moth emerges from a previously constructed exist hole in the side. The pupa silk is extruded when the moth emerges.

All of the moths obtained emerged in the laboratory from September to December inclusive of both years.

The food plant of *amphorana* extends along the railroad tracks which skirt the edge of Bellingham Bay for several miles. The infestation along this area is very great, practically every seed head showing some injury. However, the moths are not easily obtained in large series due to the great mortality among the larvae and pupae brought about by a large amount of hymenopterous parasitism.

Epinotia lindana Fern.

Although this species enjoys rather wide distribution (California, Colorado and Utah) (Heinrich, C. H., U.S.N.M. Bul. 123: 206, 1932) it is rarely collected in this vicinity (Pullman, Washington). Until this year I had collected only two specimens (one, Union Flat, Whitman County, Washington, 23-x-29, in U.S.N.M., and one, Pullman, 4-x-30, Clarke Nos. 815 and 1706 respectively).

This season a small number of larvae, from which a series of eight specimens of this species was obtained, were collected on *Cornus stolonifera*

Michx. The larva is a leaf tier chiefly in the terminal leaves, although on occasion the larva will attack some of the larger leaves along the branches. The leaves are very much distorted by the tying and feeding of the larva.

The larva is as follows: Cylindrical, robust, thickest at about middle, rather sluggish. Length 13-15 mm. Head light brown, mouth parts, ocellar area and epicranial suture, dark brown. Through the translucent yellowish-brown cervical shield may be seen the dark brown posterior edge of the head. Shield dark brown posteriorly and laterally, edged with dirty whitish anteriorly. Subspiracular warts of prothorax dark brown. Thoracic and abdominal segments dirty yellowish-white; tubercles and hairs concolorous. Suranal plate indicated by a few brown spots. Thoracic legs concolorous with segments except for the dark brown basal and distal ends.

The larvae from which this series was obtained were collected on June 19 and June 22, 1933, at Pullman, Washington, by the writer. The first three larvae to mature entered the soil in the bottom of the breeding chamber on June 26. The others followed very soon afterwards. The larvae do not pupate immediately but remain as larvae for a month or more in their pupation cells. One larva spun up under a dried leaf-fragment, which it attached to the bottom of the breeding tin. The first moth emerged on August 26 and the last on September 15, 1933.

My thanks are due Mr. August Busck for many helpful suggestions and criticisms.

EXPLANATION OF PLATE.

Fig. 1. *Gnorimoschema lutescella,* male genitalia, aedoeagus to right.
Fig. 1a *Gnorimoschema lutescella,* ventral view of tegumen to show gnathos.
Fig. 2. *Gnorimoschema lutescella,* female genitalia.
Fig. 3. *Gelechia caudatae,* male genitalia with aedoeagus to left.
Fig. 4. *Gelechia caudatae,* female genitalia.
Fig. 5. *Gelechia lepidotae,* male genitalia.
Fig. 5a. *Gelechia lepidotae,* aedoeagus.
Fig. 6. *Gelechia ornatifimbriella* Clemens, aedoeagus.
Fig. 7. *Gelechia lepidotae,* female genitalia with signum to right.

NEW SPECIES OF NORTH AMERICAN EPHEMEROPTERA IV.

BY J. MCDUNNOUGH,

Ottawa, Ontario.

(continued from page 164)

Genus **Cinygma** Eaton

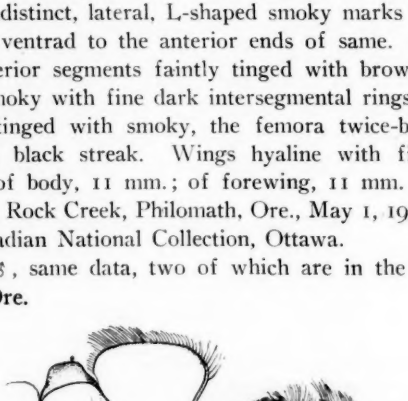
In my paper on the nymph of *Cinygma integrum* (1933, Can. Ent. LXV, 73) there is a rather serious error which I wish to correct. At the time my material was limited to a single nymphal exuvia; now with the mature nymphs and more exuviae at my disposal I find that the peculiar nature of the maxillae, as described and figured in the above paper, was abnormal and probably brought about by contraction occurring during the process of making a slide of the mouth-parts. I present a corrected drawing of the maxillae with the hypopharynx and paragnatha attached; from this it is at once evident that the maxilla is shaped much as in *Heptagenia,* so that my original contention that the genus *Cinygma* was closely allied to *Heptagenia* receives additional support.

Cinygma dimicki n. sp.

Head pale yellowish faintly tinged with light brownish on vertex. Pronotum pale ochreous tinged with brownish, each lobe bordered laterally by a black line and with an oblique black median streak; a strong black streak at base of foreleg. Mesonotum pale brownish, lateral edges and scutellum light yellow; pleura pale brownish with a light yellow patch anterior to wing base, this patch bordered both dorsally and ventrally by distinct black streaks; black streaks at bases of both mid and hind legs. Metanotum pale brownish with a paler, more yellowish, median projection. Abdomen with segments I-VII pale hyaline yellowish, each segment with narrow posterior black border and with dark streak on posterior half of lateral edge; last three segments opaque, tinged with light brown. On all but the first and the last two segments there are indistinct, lateral, L-shaped smoky marks with small comma-like streaks attached ventrad to the anterior ends of same. Ventrally pale yellowish, the two posterior segments faintly tinged with brownish. Forceps pale smoky; setae deep smoky with fine dark intersegmental rings. Legs dull amber, the tibae and tarsi tinged with smoky, the femora twice-banded with purple-brown, coxa with a black streak. Wings hyaline with fine dark veins and crossveins. Length of body, 11 mm.; of forewing, 11 mm.

Holotype— ♂, Rock Creek, Philomath, Ore., May 1, 1934, (R. E. Dimick); No. 3814 in the Canadian National Collection, Ottawa.

Paratypes—4 ♂, same data, two of which are in the Coll. Oregon State College, Corvallis, Ore.



Maxilla and hypopharynx of *Cinygma integrum* Eat.

The male genitalia are quite similar to those of *integrum,* but the stimuli are smaller, and the apex of each penis-lobe is evenly rounded and without the slight tooth found in *integrum;* there is also less of a lateral excavation at the junction between the basal and apical sections. Both species show a pair of minute spines dorsally near the base of each penis-lobe, a feature not shown in my drawing of *integrum* (1926, Can. Ent. LVIII, 302). I take much pleasure in naming this species after Dr. R. E. Dimick who is considerably advancing our knowledge of the western American Ephemerid fauna by his investigations in the state of Oregon.

Cinygmula gartrelli n. sp.

Male. Eyes (dried) deep black-brown, not contiguous. Head with anterior portion sepia-brown with paler antennal pits and some black shading on

each side of the vertical keel; vertex of head behind the ocelli deep blackish. Thorax dorsally sepia-brown, shading into black-brown on mesonotum posteriorly and with lighter shades on anterior projection of mesonotum and faintly cephalad of scutellum; pleura brown, with the membranous portions paler, a wine-colored patch anterior to base of forewing from which a pale ochreous dash projects towards the pronotum; there are also faint ruddy tinges at bases of legs; sternum brown, shaded with black brown. Abdomen dorsally with segment I deep brown, segments II-VII with anterior half pale, semihyaline ochreous-brown, the posterior portion deeper brown with a slight ruddy tinge, giving a distinct banded appearance; segments VIII-X opaque, more evenly dark brown with the paler areas showing as small lateral patches on VIII and IX. Ventrally light ochre-brown, faintly tinged with ruddy along posterior margins and at times on three posterior segments; ganglionic marks very faintly visible. Forceps and setae deep smoky. Forelegs deep smoky-brown, tibia slightly longer than combined trochanter and femur; mid and hind legs paler brown with slight ruddy tinge on the femora. Wings very characteristically marked, hyaline with a brownish-amber tinge at base, extending more faintly along costal region of both wings; veins fine, brown; crossveins strong, brown, lightly bordered in the costal half of forewing with brown shading which gives them a decidedly thickened appearance in this region.

Female. Slightly paler than male. Head light brown, shaded with ruddier brown next the eyes. Pleura and abdomen with more extended ruddy brown suffusion than in the male. Forelegs paler. Length of body, 9 mm.; or forewing, 10 mm.

Holotype—♂, Deep Creek, Peachland, B. C., May 23, (A. N. Gartrell); No. 3768 in the Canadian National Collection, Ottawa.

Allotype—♀, same data.

Paratypes—20♂, 15♀, same data.

This species belongs in the *mimus* group according to male genitalia, differing in the presence of a small subapical spine on the ventral surface of each penis-lobe. *Mimus* shows none of the heavy dark cross-veining on the forewings found in the present species, and is somewhat smaller and occurs about a month later in the year.

Cinygmula uniformis n. sp.

Very similar to the preceding in genitalic characters. Differs at once by the uniform light amber coloration of the entire wings and the lack of heavy cross-veining.

Male. Head smoky brown with the pits of the antennae pale ochreous; thorax brown, a slightly paler shade than in *gartrelli*, with more extended lighter brown shading cephalad of the scutellum; pleural coloration much as in *gartrelli*. Abdomen dorsally with the hyaline areas on segments II-VII more extended, in consequence the brown posterior banding is narrower and also paler, showing none of the ruddy shades of *gartrelli;* the opaque posterior segments are almost unicolorous sepia-brown with a fine, blackish, posterior border to VIII. Ventrally very pale ochreous, segments VIII and IX shaded with light ochre-brown; ganglionic marks very faint, slightly ruddy. Forceps and setae light smoky. Legs light brown, the anterior tibia considerably longer than

trochanter and femur combined and longer than the same joint in *gartrelli;* mid and hind femora lightly tinged with ruddy. Wings *unicolorous light amber* with fine brown veins and crossveins.

Female. Very similar to male. Head brown, frequently with considerable ruddy suffusion, vertex tipped laterally with light ochreous. Length of body, 9-10 mm.; of forewing, 10 mm.

Holotype—♂, Shingle Creek, Penticton, B. C., Oct. 4, (A. N. Gartrell) (bred from nymph); No. 3769 in the Canadian National Collection, Ottawa.

Allotype—♀, same data, Oct. 3.

Paratypes—21 ♂, 20 ♀, same data, Oct. 3, 4, 5, 9.

Further bred specimens before me are from Powers Creek, Westbank, B. C., Oct. 1-17.

The nymph is a typical *Cinygmula,* slender, light brown, streaked on the thorax with pale ochreous. The abdominal maculation consists of a pale broken dorsal line, of varying width and intensity, flanked on each side by two minute pale dots; there are also pale, broken submedian bands and traces of pale markings along the lateral edge; on segments VIII and IX the pale markings may coalesce, in which case the whole segment is pale with an irregular dark anterior border. Ventrally pale with faint median brown lunate marks and lateral longitudinal streaks on the last four segments. Tails pale ochreous. Legs pale ochreous with two broad bands of brown on femora. Gills broadly oval, moderately well tracheated, pale whitish with the dorsal half distinctly suffused with smoky. *No filaments* at bases of gills.

The male genitalia are very close to those of *gartrelli;* the subapical spines, however, of the penis-lobes are slightly stouter and show a tendency to become bifid at tip; further the outer edges of the stimuli are not so distinctly spined, there being at the most a minute apical spine, causing the tip to appear faintly bifid.

Cinygmula reticulata n. sp.

Very similar to *mimus* Eat. differing principally in the maculation of the wings.

Male. Head and thorax brown, the latter with the usual lighter brown shading in the region anterior to scutellum and with the pleura streaked with light ochreous; a faint ruddy patch anterior to base of forewing. Abdomen dorsally with the anterior half of segments II-VII hyaline, the posterior half irregularly, purple-brown (deeper in color than in *mimus*), segments VIII-X opaque, largely purple-brown, with lighter brown shades along lateral edges, and also on posterior margin of X. Ventrally with much the same coloration, but considerably paler, genital plate light ochre-brown; traces of ganglionic marks. Forceps and setae light smoky. Legs pale brown, the femora with faint ruddy tinges. Wings entirely suffused with pale amber, veins and crossveins brown, the latter broadly but rather faintly bordered with pale smoky, giving a very characteristic checkered appearance to the entire wings, a feature not at all present in *mimus.* The male genitalia are so very similar to those of *mimus* that no definite character for separation can be given, unless it be that the stimuli are somewhat larger.

Female. Quite similar to male but crossveins on wings less distinctly bordered with smoky. Head rather light ochre-brown, slightly reticulate with smoky and with a darker shading posterior to the mid-ocellus. Length of body, 8 mm.; of forewing, 9 mm.

Holotype—♂, Luckiamute River, Kings Valley, Ore., May 10, 1933, (R. Dimick); No. 3770 in the Canadian National Collection, Ottawa.

Allotype—♀, same data, May 16.

Paratypes—1 ♂, same data, May 16; 11 ♂, Marion Cr. (trib. Santiam Riv.) Ore., March 14, 1934; 2 ♀, Zig-zag, Ore., May 3, 1934; these last two lots received after completion of this paper and mostly deposited in the Coll. Oregon State College, Corvallis, Ore.

The 1933 specimens are marked as having been reared, but I have no data on the nymph.

Genus **Rhithrogena** Eaton

The western species of the *brunnea-doddsi* group are so similar in general color and maculation that without a careful study of the male genitalia it is almost impossible to identify them correctly. The penes are long and rod-like and the chief characteristic of the group is the presence of a strong lateral spine at the base of each penis-lobe. A detailed study of considerable accumulated material has convinced me that the group is in need of a certain amount of revision and that it includes several undescribed species.

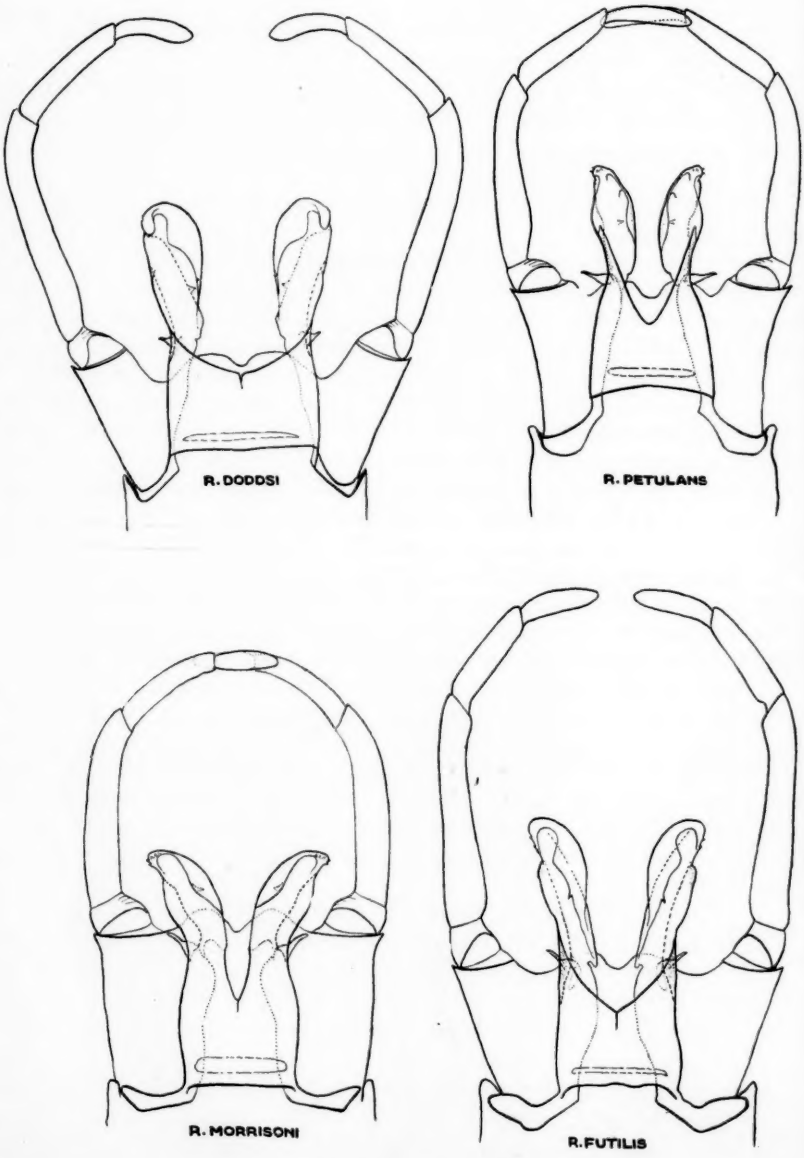
In the first place I find that my identification of *brunnea* Hag. (1928, Can. Ent. LX, 9) has been incorrect; I have recently been able to study a slide of the genitalia of the type male specimen in the Museum of Comparative Zoology at Cambridge, Mass., from the Sierra Nevada Mts., Calif. I am unable to match it with anything before me; it appears to be a distinct species and Eaton's figure of the ventral surface (right-hand side) is good; I would call particular attention to the excurved apex of each lobe and the strong spine near the inner margin.

Through the co-operation of Dr. J. Traver at Cornell University the identity of *petulans* Seemann (1927, Jour. Ent. & Zool. 42, Pl. IV, fig. 3) has been established; we find that the original drawing of the genitalia has omitted several small, but important details. Finally of the remaining three described species, viz. *morrisoni* Banks, *flavianula* McD., and *doddsi* McD., I have paratype and type material respectively before me. With the aid of the following key and drawings the species should now be capable of separation without undue difficulty.

KEY TO SPECIES OF BRUNNEA GROUP OF RHITHROGENA.

1. Latero-apical edge of each penis-lobe drawn out to a small, sharp spine as in *Heptagenia* ..... *virilis* n. sp.
   Latero-apical edge of penis-lobe rounded, without spine..... 2
2. Each penis-lobe with ventral spine situated near inner margin, about halfway between lateral spine and apex..... 4
   Each penis-lobe without ventral spine but with one or more dorsal ones situated in central area..... 3
3. A single central dorsal spine on each lobe, smaller species.... *futilis* n. sp.
   Five or six dorsal spines on each lobe; large species..... *flavianula* McD.
4. Penis-lobes only slightly divergent apically..... 6

CAN. ENT. VOL. LXVI PLATE 10.



NORTH AMERICAN EPHEMEROPTERA.

Penis-lobes strongly divergent apically 5

5. Penis-lobe narrowed apically with a curved row of 5-6 small ventral spines ..... *morrisoni* Banks

Penis-lobe broader apically, with stronger mid-ventral spine and weaker apical ones ..... *brunnea* Hag.

6. Penis-lobe broad apically with latero-apical spining minute.... *doddsi* McD.

Penis-lobe narrowed apically with better developed latero-apical spining ..... *petulans* Smn.

Rhithrogena virilis n. sp.

Male. A large species with the usual almost unicolorous, brown coloration. Head brown with ochreous shading around bases of antennae and the anterior portion suffused with smoky. Notum brown, with the scutellum and adjacent parts light ochre-brown; pleura shaded with ochreous, particularly anterior to base of wings, a dark streak from base of forewing to pronotum; sternum tinged with smoky in median area. Abdomen brown, irregularly paler along lateral edge and on posterior segments ventrally. Forceps and setae deep smoky. Forelegs deep smoky; mid and hind legs lighter brown with the usual smoky streak on each femur. Wings hyaline with a faint tinge of amber along costa; veins and crossveins fine, deep brown, the latter anastomosing as usual in pterostigmatic region.

Female. Head suffused with smoky anterior to antennae; area between ocelli and antennae light ochreous; next the eyes and posterior to ocelli light ruddy brown with a slight median smoky tinge and the vertex in lateral angles slightly ochreous. Otherwise very similar to male, but with slightly paler thorax. Length of body, 12 mm.; of forewing, 15 mm.

Holotype—♂, Faulder, nr. Summerland, B. C., June 27, (A. N. Gartrell) (bred from nymph); No. 3771 in the Canadian National Collection, Ottawa.

Allotype—♀, same data.

Paratypes—1 ♂, 4 ♀, same data, June 24, 25, 27, 29; 1 ♂ (in alcohol) June 25.

I have also examined specimens in alcohol from Jasper Park, Alta., which as already noted, I have previously identified as *brunnea* Hag. A single female from Blairmore, Alta., (July 14) is also in the collection. The nymph is a typical *Rhithrogena;* dark brown, with three pale yellowish tails; the large gills are tinged with purplish in dorsal half and the brown femora have a broad pale streak extending from base to beyond half. There is no abdominal pattern visible in the nymphal exuviae other than a pair of very minute subdorsal pale dots on the last four or five segments.

Rhithrogena futilis n. sp.

Scarcely distinguishable except on genital characters from *doddsi* McD. As compared with the type series of this latter species the present one is slightly larger in size and the general color is a deeper brown. The abdomen is very narrowly ringed with light ochreous in the interspaceal area and on dorsum this pale area shows a faint smoky transverse streak. Anterior to the base of forewing is a light ochreous patch tinged with ruddy-brown posteriorly and bisected by a blackish streak. The usual dark streaks are present on the femora.

As compared with those of *doddsi* the male genitalia show narrower and

slightly more divergent penis-lobes apically, the centro-ventral small spine is lacking and in its place we find a small dorsal spine in much the same position; the minute apical spines on outer edge of each lobe which are present in most of the species of the group are somewhat better developed than in *doddsi,* but not as strong as in *morrisoni.* Length of body, 11 mm.; of forewing, 11.5 mm.

Holotype—♂, Gardiner Riv., Yellowstone Nat. Park, Wyo.. July 26, 1928, (J. McDunnough); No. 3772 in the Canadian National Collection, Ottawa.

Allotype—♀, same data.

Paratypes—24 ♂, 7 ♀, same data.

Besides the type lot I have series before me from Waterton Lakes, Alta., (Aug. 23); Blairmore, Alta., (Aug. 14); and Banff, Alta., (Sept. 1, 4) which agree in genital characters. These are all slightly smaller in size than the Wyoming specimens and the Waterton ones are paler in color. The species I recorded as *doddsi* from Jasper Park, Alta., also belongs here. As far as I am able to judge the flight of the species appears to be at a considerably later date than that of ***doddsi.***

Rhithrogena morrisoni Banks

Epeorus morrisoni Banks, 1924, Bull. Mus. Comp. Zool. LXV, 424.
Heptagenia morrisoni McDunnough, 1925, Can. Ent. LVII, 191.

The species was described from material from Reno, Nevada. There is a small series before me from Old Man. Riv. McLeod, Alta., May 14, 1930, (J. H. Pepper) which is our only Canadian record.

A LIST OF THE BUTTERFLIES OF MAINE WITH NOTES CONCERNING SOME OF THEM (LEPID. RHOPALOCERA).

BY C. F. DOSPASSOS AND L. P. GREY,

Mendham, New Jersey. Lincoln, Maine.

Fifty years have elapsed since the publication of Fernald's "Butterflies of Maine." In the meantime, many new records have been made and the number of species reported from the state has increased from sixty-nine to over one hundred.

Our records have been compiled from many sources. Special thanks are due Mr. Donald W. Farquhar, of the Biological Institute, Harvard University, for many unusual ones.

Unless otherwise stated, the following locality records are to be credited to the collectors respectively indicated: Lincoln, Grey; Mt. Desert, C. W. Johnson; Norway, S. J. Smith; Orono, Fernald; Passadumkeag, Grey; Portland, Lyman; Rangeley and Stratton, dos Passos; Waterville, Hamlin; York and York Beach, Farquhar.

When definite records are not given, statewide occurrence may be assumed. The months given are intended to cover the complete period of adult flight. Species prefixed by an asterisk (*) are probably strays.

**Papilio philenor* Linneaus. Reported from Bar Harbor. (Aaron).

Papilio polyxenes asterius Cramer. Not rare. Two broods. May-Aug. Battered individuals in Sept.

Papilio glaucus Linnaeus. Common. One brood. Females to Aug. The dark female form does not occur, but a freak specimen taken at Lincoln was about

half-way between the two extremes. Majority of specimens found in late June.

Papilio glaucus canadensis Rothchild & Jordan. Scarce.

**Papilio cresphontes* Cramer. Reported from Eastport. (Hy. Edwards).

Piepis napi oleracea Harris. We have a few recent records, but it is a rare insect. May-June.

Pieris napi cruciferarum Boisduval. Lincoln (Clayton). June-July.

Pieris rapae Linnaeus. Common everywhere. May-Sept.

Pieris rapae immaculata Skinner & Aaron. Prevalent in the first brood.

Pieris rapae ab. novangliae Scudder. Not reported for many years. Formerly taken at Waterville and Portland.

**Catopsilia eubule* Linnaeus. Canton (Parlin). Aug.-Sept.

**Catopsilia philea* Linnaeus. Mr. Farquhar kindly informs us that he has seen a specimen of Maine origin, although the definite locality was not known to him.

**Catopsilia agarithe* Boisduval. Kittery Point (Thaxter). A remarkable record.

Eurymus eurytheme (Boisduval). We have a scattering of records for this recent intruder. No spring specimens have as yet been reported. Aug.-Sept.

Eurymus philodice (Godart). Common everywhere. May-Oct. The early spring specimens represent *anthyale* Hubner.

Eurymus philodice ab. alba Strecker. Usually scarce.

Eurymus interior (Scudder). Not rare in Northern and Western Maine, but local. Albino females are occasionally found.

Eurema euterpe Ménetries. Mt. Desert (Thaxter); Rangeley; Bar Harbor (Brower); York Beach; Biddeford Pool (Farquhar). July-Aug.

Danaus menippe (Hubner). Usually a scarce migrant, although it has been reported as common at times in some localities. July-Sept.

Enodia portlandia (Fabricius). Found sparingly and locally. June-July.

Note: All *Satyrids* are single-brooded, in Maine.

Satyrodes eurydice (Johannsen). Not rare in grassy marsh land. July.

Cissia eurytus Fabricius. Portland; Norway; Brunswick (Packard).

Cercyonis alope (Fabricius). The typical form is common in Southern Maine, July-Aug. A gynandromorph was taken at Lincoln.

Cercyonis alope maritima (Edwards). Not rare.

Cercyonis alope nephele (Kirby). Replacing the typical form in Northern Maine.

Oeneis jutta (Hubner). Passadumkeag; Lincoln (Clayton). Hitherto reported only from the Orono-Stillwater Bog. June.

Oeneis polixenes katahdin (Newcomb). Mt. Katahdin. 4500'-5000'. July.

Euptoieta claudia (Cramer). Portland (Lyman); Old Orchard (Abbott); Kittery (Minot and R. Thaxter). Aug.-Sept.

Argynnis idalia Drury. Waterville; Norway; Portland; Wales (Frost); Brunswick (Packard). July-Aug.

Argynnis cybele Fabricius. Common. July-Sept. Specimens approaching *carpenteri* Edwards are found.

Argynnis aphrodite Fabricius. Usually scarce. Females rare. July-Aug. Maine specimens probably represent race *winni* Gunder.

Argynnis atlantis Edwards. Common. Late June-Sept. One brood.

Brenthis myrina (Cramer). Common. Note: Species of the genus *Brenthis* are double brooded in Maine. May-Sept.

Brenthis myrina atrocostalis Huard. Found in Northern and Western Maine, with *myrina*.

Brenthis bellona (Fabricius). Common, preferring low moist land. The form *toddi* Holland, occurs at Lincoln, along the Penobscot River.

Euphydryas phaeton (Drury). Locally common. Late June-Aug. One brood.

Euphydryas phaeton ab. streckeri Ellsworth. Rare. Colony at Lincoln.

Melitaea harrisi Scudder. Usually abundant. June-Aug. The light phase, *albimontana* Avinoff, occurs sparingly, and extreme melanic specimens are sometimes taken.

Phyciodes nyteis (Doubleday & Hewitson). Mt. Katahdin (Farquhar); Orono; Lewiston (Sprague); Mt. Desert. June-July.

Phyciodes tharos (Drury). Common everywhere. June-July.

Phyciodes tharos marcia (Edwards). Common, intergrading with *tharos*. Note: There is no definite record for *Phyciodes batesi* (Reakirt), but it is likely to be found, when the state is more closely explored.

Polygonia interrogationis (Fabricius). Very rare, but several records.

Polygonia interrogationis umbrosa (Lintner). Lincoln (Clayton); York.

Polygonia comma (Harris). Very rare. Several Maine records.

Polygonia comma dryas (Edwards). Lincoln; York.

Polygonia gracilis (Grote & Robinson). Very rare. A scattering of records.

Polygonia faunus (Edwards). Well-distributed, but seldom common.

Polygonia progne (Cramer). Not rare. The usual form seems to be *1-argenteum* Scudder. Note: Species of the genus *Polygonia*, as well as of *Aglais* and *Vanessa*, emerge from July onward, and hibernate, to reappear the following spring.

Aglais j-album Boisduval & Leconte. Statewide, but seldom plentiful.

Aglais milberti Godart. Usually scarce.

Aglais antiopa Linnaeus. Usually common, but some years it is heavily parasitized.

Vanessa atalanta Linnaeus. Common some years, but often scarce or absent.

Vanessa cardui Linnaeus. Common by "big years."

Vanessa virginiensis Drury. Very common in 1929. Often scarce.

**Junonia coenia* Hubner. Lincoln (Clayton); Bangor (Braun); Cape Medick (Thaxter).

Basilarchia arthemis (Drury). Not scarce, although females are difficult to find. One brood. June-July.

Basilarchia arthemis proserpina (Edwards). Mt. Desert; Portland (Lyman).

Basilarchia astyanax (Fabricius) has been reported from Portland but the specimens are believed to have been *proserpina*.

Basilarchia archippus (Cramer). Common. Two broods, the second, partial. Specimens approaching *lanthanis* Cook & Watson, are found.

Strymon acadica (Edwards). Lincoln (Clayton). Note: Maine *Theclas* are local, and usually rare. One brood, in May or June.

Strymon melinus Hubner. Several records, but mostly from the Southern part of the state.

Strymon ontario (Edwards). Monmouth (Frost). July.

Strymon titus (Fabricius). Norway; Portland; York.

Strymon edwardsi (Saunders). Hallowell (Wadsworth). Orono.

Strymon calanus (Hubner). Norway; Salisbury Cove; Mt. Desert.

Strymon liparops strigosa Harris. Several records, but apparently rare.

Incisalia augustus Kirby. Scarce, but widespread.

Incisalia henrici (Grote & Robinson). Lincoln (Clayton). Fernald's Orono record for *henrici* is doubtful, because he describes an insect with a stigma, while *henrici* has none.

Incisalia irus (Godart). Norway (Smith). Also reported by Grote & Robinson. We do not feel sure of Fernald's Orono record.

Incisalia polios Cook & Watson. Lincoln (Clayton); Stratton; Mt. Agamenticus (Farquhar). This species will probably be found widespread.

Incisalia niphon (Hubner). The most common *Thecla,* but seldom plentiful. Northern Maine specimens are much duller below than is usual. Some atypical dwarf representatives contrast very sharply with Massachusetts examples.

Erora laeta (Edwards). Paris (Scudder); Lincoln (Clayton); Mt. Desert (Brower). The foodplant of this rare insect is reported to be Beech.

Feniseca tarquinius (Fabricius). Not common. Two broods. May-Aug.

Heodes hypophlaeas Boisduval. Common everywhere. Two broods. May-Sept.

Heodes hypophlaeas ab. fullious Hulst. Ellsworth (Braun).

Heodes epixanthe Boisduval & Leconte. Common on many Maine bogs. July.

Heodes thoe (Gueneé). Colony at York Beach.

Everes comyntas (Godart). Usually rare, but well-distributed. Two broods. May-Sept.

Plebejus saepiolus insulana Blackmore. This insect was first observed in Maine in 1929. Since that time it has increased rapidly, and is now fairly common in many widely separated localities in Northern and Western Maine. The foodplant, in Maine, is believed to be *Trifolium hybridum* Linnaeus. The insect passes the winter in the larval stage. June-July.

Lycaenopsis pseudargiolus (Boisduval & Leconte). Rare, and smaller than more southern specimens. It and its forms emerge from early May to July.

Lycaenopsis pseudargiolus lucia (Kirby). Common. Found in both spring and summer emergences, as is the next following.

Lycaenopsis pseudargiolus marginata (Edwards). Common. The prevalent summer form, in Maine.

**Epargyreus tityrus* (Fabricius). A rare stray. Canton (Parlin).

Cocceius pylades Scudder. Abundant. June-July.

Pholisora catullus (Fabricius). We know but one record. Norway.

Thanaos icelus (Scudder & Burgess). Common. May-July.

Thanaos persius Scudder. Norway; Moosehead Lake (Scudder).

Thanaos brizo Boisduval & Leconte. Rare. A few Maine records. We have no Maine records for *Thanaos juvenalis* (Fabricius), or for *Thanaos horatius*

(Scudder & Burgess) but these two species are likely to stray into Southern Maine.

Carterocephalus palaemon Palas. Locally common. May-June.

Ancyloxypha numitor (Fabricius). Very local. Passadumkeag; common at Nicatous Lake in 1931 (Grey). Two broods. May-Sept.

Pamphila comma manitoba Scudder. A local insect. Rangeley; Lincoln; Mt. Desert (Brower) Aug.-Sept.

Pamphila metea Scudder. Cape Neddick, the northernmost record (Farquhar).

Pamphila leonardus Harris. Not rare. Aug.-Sept.

Pamphila sassacus Harris. Statewide. June-July. Specimens grading into *manitoboides* Fletcher are found.

Polites cernes Boisduval & Lecont. Very common. June-July.

Polites manataaqua (Scudder). Portland; Carratunk (Brower).

Catia otho egeremet (Scudder). Mt. Desert.

Poanes hobomok (Harris). Very common. June-July.

Poanes hobomok pocahontas (Scudder). Portland; York Beach. Rare.

Poanes hobomok near *alfaratta* Holl. Lincoln (dos Passos).

Euphyes vestris Boisduval. Usually rather common. June-July.

Euphyes bimacula Grote & Robinson. Very local and usually scarce. Strickly an insect of bogs and marshes. June-July.

Amblyscirtes vialis (Edwards). Common and widespread. June-July.

Amblyscirtes hegon (Scudder). Widely distributed, but rare. June-July.

BOOK NOTICE.

Entomology with Reference to Its Ecological Aspects, by J. W. Folsom and R. A. Wardle, P. Blackiston's Son & Co., Inc., Philadelphia: 1934, pp. viii, 605, 5 plates, 308 figures. $4.00.

This new edition of Folsom's well-known text has been prepared by Professor R. A. Wardle with his usual thoroughness and attention to essentials. In this revision the original structure and many of the features of popular interest of the earlier editions have been retained, although modified by the addition of new material bringing the book up-to-date with the recent advances in our knowledge of insects.

The introductory chapter deals with the classification of insects into orders and includes a section on the probable interrelations of the orders. This is followed by a lengthy chapter on insect anatomy and physiology in which both external and internal anatomy are discussed with moderate detail, the latter by systems. The third chapter deals with the embryonic and post-embryonic development of insects. The next three chapters deal in an engaging manner with the adaptations of aquatic insects, color and coloration and adaptive coloration. Chapters seven, eight and nine discuss insects in relation to plants, other animals and insects and disease. These are followed by chapters on insect interrelations, behaviour and distribution. Chapter Thirteen summarizes in a concise manner the essentials of insect ecology in the light of the recent advances in our knowledge of the subject. The last chapter on insects in relation to man briefly discusses the world-wide field of applied entomology.

An especially valuable feature of this book is the extensive bibliography arranged under topics corresponding to the chapters of the text.

R. H. OZBURN.

Date mailed, Sept. 2, 1934.